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## ORIGINAL ARTICLE

### THE EFFECTIVENESS OF PILATES EXERCISE VS FLOOR EXERCISE ON TRUNK MUSCLE ENDURANCE AMONG CRICKETERS

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#### ABSTRACT

**Background of the Study:** Cricket is the most popular and most common sport played by men and women in India. Since cricketer's body demand is often high as players require to bat, bowl, and field at various time throughout the game core endurance plays a vital role. The main objective was to analyze the effectiveness of Pilates exercise vs floor exercise on trunk muscle endurance among cricketers. **Methodology:** 30 male cricket players were recruited from Faculty of physiotherapy Dr. M.G.R Educational and Research Institute with the age group of 18-25 years. Cricket players were included after specific selection criteria for the study. Trunk muscle endurance exercises were given to the participants for 8 weeks. McGill's torso endurance battery test used to measure the trunk muscle endurance before and after the training. The trunk exercise training was given to all cricketers. Both group A and B were independently prescribed exercise performed for alternate days in a week for 30 minutes per day and this would have been followed for 8 weeks. Paired t-test analyses were used to find the significant difference between pre and posttest measurement. **Result:** After the analysis, the results revealed significant improvement of trunk muscle endurance in both the groups (P value >0.0001). The Pilates group showed significant results when compared with the floor exercise group. **Conclusion:** The study showed beneficial results in both the groups, the result reflected that the Pilates exercise group had better improvement than the floor exercise group on trunk muscle endurance among cricketers.

**Keyword:** Cricketers; Floor exercises; Pilates exercises; Trunk muscle endurance

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## INTRODUCTION

Cricket is one of the most popular and most commonly played game in India by both men and women irrespective of their ages. Since cricket includes batting, bowling and fielding throughout the game consequently. It holds on a high body demand; the body requires right strengthening and conditioning. Even though cricket is one of the oldest organized sports, there are only few studies in the physical demands of the game. Peak physical conditioning and strengthening is very much needed not only for performance, but also for prevention of injuries<sup>1,2</sup>.

Muscle endurance is a muscle ability to contract repeatedly against a load for a longer duration without fatigue. In fact, most of our daily activities require some muscle endurance. The most important trunk stabilizers are the trunk flexors and extensors. The isometric endurance of the trunk muscles is an essential element for mechanical support of the spine in all the positions<sup>11</sup>. The musculoskeletal core of the body includes the spine, hips and pelvis, proximal lower limb and abdominal structures. Musculature is important for the maintenance of stability of spine and pelvis and helps in the generation and transfer of energy from large to small body parts during many sports activities<sup>3-5</sup>.

There are many studies which focus on various injuries on cricketers and training methods. However, the focus on trunk musculature has still been left untouched. As cricketers play for prolonged duration the body requires more muscle endurance and power was taken into main consideration in this study<sup>2</sup>. When relating to cricket, trunk muscle endurance is very essential as trunk strength is associated with the production and transference of strength

between the upper and lower limbs during the movements, besides reducing mechanical stress in the spine. It was taken into main consideration in this study<sup>8,9</sup>.

Agility is the ability to move and change direction and position of the body quickly and effectively while under control. This is an important component of many sports training sessions. Improved agility means better performance, faster response and gives edge over their competition. Stability is achieved through the co-activation of trunk muscles; therefore, endurance training has been postulated to be beneficial in training trunk muscles to provide stability. The trunk muscles have stabilizing functions that the body requires in order to fix distal segments to do their specific function such as running, agility, kicking and throwing. Trunk muscle endurance also permits core muscle stabilization for prolonged duration and in turn it facilitates persistent force transmission and production throughout the game<sup>11</sup>.

MCGILL'S trunk endurance test was used in this study to check the strength and stamina of the trunk muscles. This was used to test the flexors, extensors, and lateral muscular endurance. To strengthen the trunk muscles as a Pilates and floor exercise was being trained to the players<sup>12</sup>. The Pilates method was developed in the early part of the 20th century. Pilates exercises is a set of exercises developed by Joseph Pilates in the early 1900s to build muscular power, flexibility and muscular endurance to achieve the whole-body balance through motor performance with the technique suitable for breathing to improve the relation between mind and body. Modern Pilates practitioners perform in a series of approximately 25-50 simple, repetitive, low-impact flexibility and muscular

endurance exercises with an emphasis on muscular exertion in the abdominals, lower back, hips, thighs, and buttocks<sup>6,7</sup>.

The Pilates method integrates movement of the extremities, the multiplane functional positions and correct spinal alignment with breathing and core centering using a simple mat<sup>8</sup>. Pilates exercises through the use of various approaches, emphasize the strengthening of both abdominal and lumbar muscles while promoting good posture and body alignment. Even though Pilates has over an 80-year history, few empirical research studies have been conducted on its efficiency to improve basic physiological variables it touts improving such as muscular strength, muscular endurance, balance, flexibility, and so on. Many of the benefits that were claimed by Pilates exercises<sup>10</sup>.

The floor exercise was introduced as an individual Olympic medal sport for men in 1936 and for women in 1952. Floor exercises are a great way to have greater control over your body as they are a combination of strength as well as flexibility movements. The floor exercises are performed with the type of cloth or mat and it improves the flexibility, stability and balance of the body<sup>5</sup>. In which movements are performed on the floor in an area 12 meters (40 feet) square. In order to strengthen the trunk muscles of flexor and extensor of spine in all directions. Performing strengthening exercise has been advocated that a labile surface will provide a greater challenge to the trunk musculature, increase the dynamic balance of the subject and possibly train subjects to stabilize their spines to prevent and treat injury<sup>13</sup>.

Since, trunk muscle endurance plays an important role in injury-free performance among cricketers and endurance training prevents risk of injuries and balances the body demand in cricketers. Therefore, we decided to conduct this study on the effectiveness of Pilates exercise vs floor exercise on trunk muscle endurance among cricketers<sup>12</sup>.

**Aim of the study:** The main aim of this study was to compare the effectiveness between Pilates exercise and floor exercise on trunk muscle endurance in the selected cricketers.

The aim of this study was to investigate Pilates exercise and floor exercise on improving trunk muscle endurance in cricketers.

## METHODOLOGY

An Experimental study was done to compare the effectiveness of Pilates exercise and floor exercise on trunk muscle endurance for cricketers. This is a pre & post Comparative study type. The comparison was made before and after giving the exercises to the cricketers. Cricketers from Dr. MGR Educational and Research Institute were selected as participants of this study. The study was conducted at the Faculty of Physiotherapy Dr. M.G.R Educational and Research Institute. In this study totally 30 cricketers were selected as participants from Dr. M.G.R Educational and Research Institute. In this study, lottery sampling methods were chosen to separate the groups in a clue card with 1 to 30 numbers printed in cards, the cards were shuffled well and a card was drawn out by the subjects. If drawn cards contain odd number means, the subjects assigned for Group A - Pilates exercises. If the drawn card contains even numbers, it means the subject assigned for

Group B - Floor exercises. Informed consent was obtained from the subjects.

**Intervention duration:** Intervention made for this study was about 8 weeks along with alternate days about 30 minutes per day. Total Study Duration of the study was about 4 months from February 2021 to May 2021.

**Inclusion criteria:** Cricketer's with age limit between 18-25 years. Only male players were chosen for this study. Study samples with free from corona symptoms.

**Exclusions Criteria:** Recent injury, Low back pain, Recent back surgery, Cardiac disease and non-cooperative players were excluded from the study.

Trunk muscle endurance was an outcome measure of this study. MCGILL'S TORSO endurance battery test was used as measurement tool. Materials used were Stop watch, Mat, back supporting board, Couch for the study. Independent variables of the study were Pilates exercises and Floor exercises. Dependent variables of the study were Trunk flexor endurance test, Trunk extensor endurance test, and Trunk lateral endurance test (side-bridge test).

### Intervention:

**Group A:** This group consists of 15 players and Pilates exercises were given (Hundred, teaser, double leg stretch, roll up, cross crunches). In Group A exercises were given for 30 minutes per day and alternate days.

**Group B:** This group consists of 15 players and floor exercises were given (Dead bug, bird dogs, glute bridge, abdominal crunch, segmental

rotation). In Group B exercises were given for 30 minutes per day and alternate days.

**Procedure:** This experimental study was conducted for a period of 4 months with 30 male cricketers at the age group of 18-25 have been selected based on inclusion and exclusion criteria. They are grouped into group A and group B randomly by lottery method. The group A players were trained with Pilates exercise and group B players were trained with floor exercises in order to analyze the effectiveness of Pilates exercise & floor exercise on trunk muscle endurance among cricketers. The players were informed and signed with the consent form in order to participate in this study.

**Group A [Pilates Exercise]:** Pilates exercise is a system of exercises designed to improve physical strength, flexibility, and posture and enhance mental awareness.

### 1. Pilates Hundred:



**FIG.1:** Pilates Hundred

**Step 1:** The subjects were instructed to lie on their back with hip bent and legs parallel to the floor.

**Step 2:** And the subjects were asked to keep the head, neck relaxed while asked to lift their

shoulder girdle off the ground / mat followed by raising their arm off the floor.

**Step 3:** Then asked to move their arms up and down simultaneously while they take five short breaths to inhale and exhale.

**Muscles involved:** Abdominals, back muscles, core, arms and hips flexors.

## 2. Teaser:



FIG.2: Teaser

## 3 Double Leg Stretch:



FIG: 3 Double Leg Stretch (A and B)

**Step 1:** The subjects were asked to Lie on the mat with hip bent, feet off the floor and grab both knees.

**Step 2:** And then they were asked to lift the shoulders off the floor and extend their arms toward the ears and simultaneously extend both legs to a 45-degree angle off the floor.

**Step 1:** The subjects were instructed to Lie on their back with hip and knees bent and with feet off the mat.

**Step 2:** Now, they were instructed to create a v-shape with their torso and legs.

**Step 3:** Then asked to hold for 5 breaths & repeat it further.

**Muscles involved:** Spinal flexors, abdominalis and hip flexors muscles.



**Step 3:** And then bend the knees and tuck in the chin toward the chest after that subjects extend their arms and legs and repeat until the set is complete.

**Muscles involved:** Abdominals and core muscles.

#### 4.Roll Up:



**FIG:4** Roll Up (A and B)

**Step 1:** The subjects were instructed to lie down on the mat with legs straight and asked to extend their arms.

**Step 2:** Subjects were asked to move towards the long sitting position while attempting to touch the toes.

**Step 3:** And then return to the starting position by rolling down on the mat and repeat the exercise until the set is complete.

**Muscles involved:** Abdominalis and core muscles.

#### 5. Cross Crunches:



**FIG:5** Cross Crunches

**Step 1:** The subject was asked to lie flat on the back surface with knees bent.

**Step 2:** And then was asked to cross the right leg over the left knee meanwhile subjects are instructed to support the head with the left hand.

**Step 3:** Then the subjects were asked to crunch the trunk towards the right side and then repeat the movement, alternating sides.

**Muscles involved:** Abdominals and obliques muscles.

#### Group B [Floor Exercise]:

Floors exercise are the exercises performed with the type of cloth or mat in order to improve the flexibility, stability and balance of the body to a great extent.

##### 1. Dead bug:

**Step 1:** The subjects were instructed to lie on their back and extend the alternating arm and leg toward the ceiling.

**Step 2:** And, they were asked to lower the extended arm and leg towards the floor.

**Step 3:** After they return to the starting position, subjects are instructed to repeat the same with opposite arms and legs by switching sides until the set is complete.

**Muscles involved:** Erector spinae, obliques, rectus abdominis & transverse abdominis muscles.



**FIG:6** Dead Bug

## 2. Bird Dogs:



**FIG.7.** Bird Dogs

**Step 1:** The subjects were instructed to kneel on the exercise mat or floor with knees hip-width apart and then hands firmly placed on the floor with shoulder-width apart.

**Step 2:** And they were asked to extend one leg and extend the opposite arm at the same time.

Start on their hands and knees with the hands under the shoulders and the knees under the hips.

**Step 3:** And then return to their starting position, and continue the exercises alternating sides.

**Muscles involved:** Erector spinae, rectus abdominis & glutes muscles.

## 3 Glute Bridge:



**Fig: 8** Glute Bridge

**Step 1:** The subjects were asked to lie on the back with hands by their sides and knees bent.

**Step 2:** And then instruct to lift the hips off the mat, while keeping the back straight, and return to their starting position to repeat the movement until the set is complete.

**Muscles involved:** Hamstrings, abdominalis & glute muscles.

## 4. Prone Cobra:



**FIG.9.**Prone Cobra

**Step 1:** The subjects were instructed to lie prone and lift their chest off the ground while squeezing out their butt & shoulder blades tight with keeping the chins gently tucked in.

**Step 2:** They were instructed to hold their palms out and away from the body facing upwards so that their thumbs are turned up.

**Step3:** Subjects were instructed for 20-30 seconds.

**Muscles involved:** Lower back, glutes, trapezius, rectus abdominis, obliques and hamstrings muscles.

## 5. Segmental Rotation:



**FIG.10** Segmental Rotation

**Step 1:** The subjects were instructed to lie on their back with knees bent and back there in a neutral position.

**Step 2:** And then they were asked to tighten their abdominal muscles and then they were instructed to slowly move the knees towards right and left consequently while the shoulder is fixed on the floor.

**Muscles involved:** Core muscles.

## MCGILL'S Torso Endurance Battery Test:

- Trunk flexor endurance
- Trunk extensor endurance
- Trunk lateral endurance (side-bridge test)
- Trunk flexor endurance test

**Pre-test procedure:** The starting position requires the subject to be seated, with the hips and knees bent to 90 degrees, aligning the hips, knees, and second toe. Instruct the subject to fold his arms across the chest, touching each hand to the opposite shoulder, lean against a board positioned at a 60-degree incline, and keep the head in a neutral position. It is important to ask the subject to press the shoulders into the board and maintain this "open" position throughout the test after the board is removed. Instruct the subject to engage the abdominals to maintain a flat-to-neutral spine. The back should never be allowed to arch during the test. The therapist can anchor the toes under a strap or manually stabilize the feet if necessary. The goal of the test is to hold this 60-degree position for as long as possible without the benefit of the back support. Encourage the subject to practice this position prior to attempting the test.

**Test protocol and administration:** The therapist starts the stopwatch as he or she moves the board about 4 inches (10 cm) back, while the subject maintains the 60-degree, suspended position. Terminate the test when there is a noticeable change in the trunk position. Watch for a deviation from the neutral spine (i.e., the shoulders rounding forward) or an increase in the low-back arch. No part of the back should touch the back rest. Record the subject's time on the record sheet.

## Trunk extensor endurance test:

**Pre-test procedure:** The starting position requires the subject to be prone, positioning the iliac crests at the table edge while supporting the upper extremity on the arms, which are placed on the floor or on a riser. While the subject is supporting the weight of his upper

body, anchor the subject's lower legs to the table using a strap. If a strap is not used, the therapist will have to use his or her own body weight to stabilize the subject's legs. The goal of the test is to hold a horizontal, prone position for as long as possible. Once the subject falls below horizontal, the test is terminated. Encourage the subject to practice this position prior to attempting the test.

**Test protocol and administration:** When ready, the subject lifts/extends the torso until it is parallel to the floor with his arms crossed over the chest. Start the stopwatch as soon as the subject assumes this position. Terminate the test when the subject can no longer maintain the position. Record the subject's time on the record sheet.

#### **Trunk lateral endurance test (side-bridge test):**

**Pre-test procedure:** The starting position requires the subject to be on his side with extended legs, aligning the feet on top of each other or in a tandem position (heel-to-toe).

The subject was asked to place the lower arm under the body and the upper arm on the side of the body. When the subject is ready, instruct him or her to assume a full side-bridge position, keeping both legs extended and the sides of the feet on the floor. The elbow of the lower arm should be positioned directly under the shoulder with the forearm facing out (the forearm can be placed palm down for balance and support) and the upper arm should be resting along the side of the body or across the chest to the opposite shoulder. The hips should be elevated off the mat and the body should be in straight alignment (i.e., head, neck, torso, hips, and legs). The torso should be supported only by the subject's foot/feet and the

elbow/forearm of the lower arm. The goal of the test is to hold this position for as long as possible. Once the subject breaks the position, the test is terminated. Encourage the subject to practice this position prior to attempting the test.

**Test protocol and administration:** The therapist starts the stopwatch as the subject moves into the side-bridge position. Terminate the test when there is a noticeable change in the trunk position. A deviation from the neutral spine (i.e., the hips dropping downward). The hips shift forward or backward in an effort to maintain balance and stability. Record the subject's time on the record sheet. Repeat the test on the opposite side and record this value on the record sheet.

**Data Analysis:** Descriptive data analysis was used for demographic data. Analysis of variance (ANOVA) is a collection of statistical models and their associated estimation procedures such as the "variation" among and between groups used to analyze the difference among means. Paired t-test to analyze the difference of trunk muscle endurance within Pilates exercise and floor exercise training group.

**Descriptive Data Analysis:** In this comparative study, 30 cricketers were selected randomly and segregated by lottery method for Group A-15 participation and Group B-15 participation. Selected cricketers were between the ages of 18 to 25 years and only male cricketers were taken for this study. In group A cricketers they were given Pilates exercise training for 30 minutes per day and alternate days for 8 weeks and group B cricketers they were given floor exercise training for 30 minutes per day and alternate days for 8 weeks.

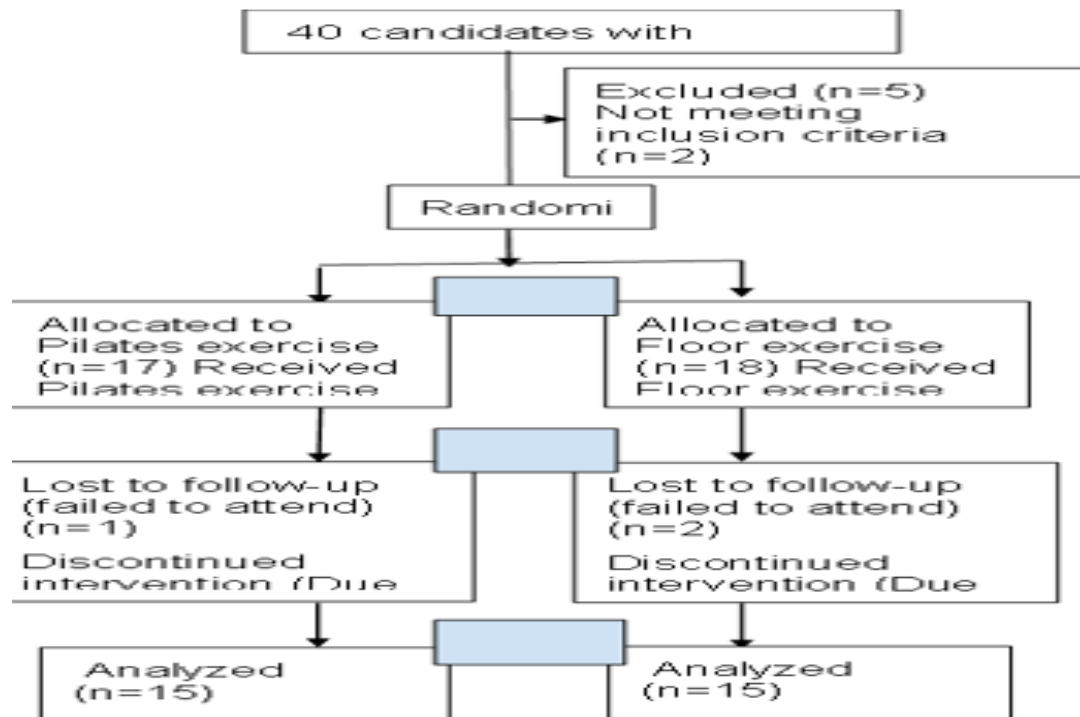


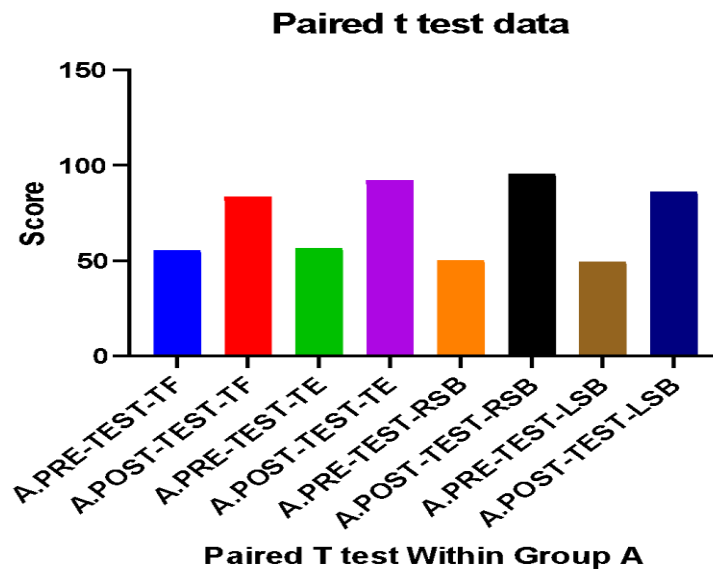
FIG.11 Consort Flow Chart Diagram

## Group A: Effect of Pilates Exercises on trunk muscle endurance among cricket players

Group A	No. of pairs	Mean Diff.	SD SEM	95% CI	df	t	P value	Sig. diff. (P<0.05)
Trunk Flexor	15	28.20	4.799 1.239	25.54 to 30.86	14	22.76	<0.0001	****
Trunk Extensor	15	35.80	4.843 1.251	33.12 to 38.48	14	28.63	<0.0001	****
Right Side Bridge	15	45.47	14.65 3.783	37.35 to 53.58	14	12.02	<0.0001	****
Left Side Bridge	15	36.67	7.669 7.669	32.42 to 40.91	14	18.52	<0.0001	****

**Table 1:** Paired t Test for Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge within the Group A

The above table 1 shows significant difference in Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge within the Group A with  $P < 0.0001$



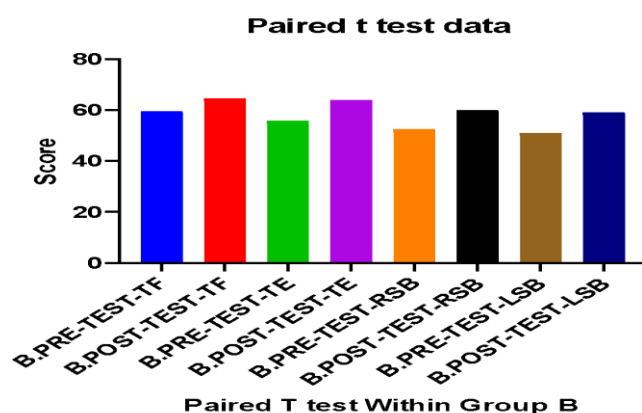
**Graph - 1:** Graphical representation of difference in Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge within the group A

**Group B:** Effect of Floor Exercises on trunk muscle endurance among cricket players

Group B	No. of pairs	Mean Diff.	SD SEM	95% CI	d f	t	P value	Sig. diff. (P<0.05)
Trunk Flexor	15	5.133	0.9904 0.2557	4.585 to 5.682	14	20.07	<0.0001	****
Trunk Extensor	15	8.067	5.663 1.462	4.931 to 11.20	14	5.517	<0.0001	****
Right Side Bridge	15	7.467	1.187	6.809 to 8.124	14	24.36	<0.0001	****
Left Side Bridge	15	8.000	1.363 0.3519	7.245 to 8.755	14	24.74	<0.0001	****

**Table 2:** Paired t Test for Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge within the Group B

The above table 2 shows significant difference in Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge within the Group A with  $P < 0.0001$



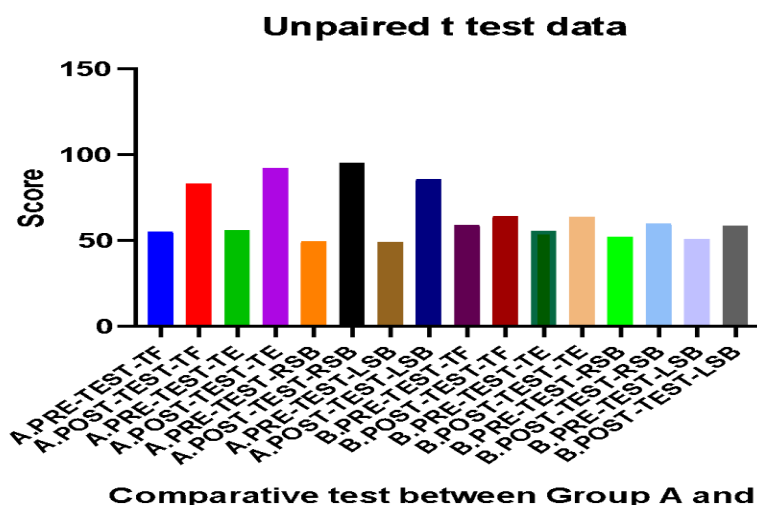
**Graph 2:** Graphical representation of difference in Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge within the group B

**Comparative effect of Pilates Exercises over Floor Exercises on trunk muscle endurance among cricket players**

Variables	Test	Group A mean	Group B mean	Df	t value	P value	Sig. different( P<0.05)
Trunk flexor	Pre test	55.53	59.73	28	0.658	0.5157	NS
Trunk extensor	Post test	83.73	64.87	28	3.114	0.0042	**
Right side bridge	Pre test	56.67	56.07	28	0.1197	0.9055	NS
Left side bridge	Post test	92.47	64.13	28	5.722	<0.0001	****
Trunk flexor	Pre test	50.20	52.67	28	0.589	0.5604	NS
Trunk extensor	Post test	95.67	60.13	28	6.601	<0.0001	****
Right side bridge	Pre test	49.67	51.20	28	0.4355	0.6666	NS
Left side bridge	Post test	86.33	59.20	28	6.406	<0.0001	****

**Table 3:** Comparative unpaired t test for Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge between the Groups A and B

The above table 3 shows significance difference in Trunk flexor, Trunk Extensor, Trunk Right and Left Side Bridge between the Groups A and B



**GRAPH - 3:** Graphical representation of difference in trunk flexor, trunk extensor, trunk right and left side bridge within the group A and B

## RESULTS

Total 30 participants were included in the study based on specific selection criteria. In Group A, Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge has increased with mean difference of 28.20, 35.80, 45.47, 36.67 by Pilates Exercise with P value  $>0.0001$ , on trunk muscle endurance among cricket players.

In Group B, Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge has increased with mean difference of 5.133, 8.067, 7.467, 8.000 respectively by Floor Exercise with P value  $>0.0001$ , on trunk muscle endurance among cricket players.

Comparative study between Group A and Group B showed significant differences found in effectiveness in Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge with P value 0.0042,  $<0.0001$  respectively on trunk muscle endurance among cricket players.

Group A found more effectiveness with mean differences of 28.20, 35.80, 45.47, 36.67 respectively on Trunk Flexor, Trunk Extensor, Trunk Right and Left Side Bridge, compared to Group B in muscle endurance among cricket players.

## DISCUSSION

The above table 1 shows the mean value of paired t test for trunk flexor, trunk extensor, trunk right and left side bridge with 28.20, 35.80, 45.47 and 36.67 respectively. The above table 2 shows the mean value of paired t test for trunk flexor, trunk extensor, trunk right and left side bridge with 5.133, 8.067, 7.467 and 8.000 respectively.

The above table 3 shows significant difference in Group A (Pilates exercise) and Group B (floor exercise) on trunk muscle endurance among cricketers with mean difference of P value 0.0042,  $<0.0001$ .

The present study was carried out to find the effectiveness of floor exercises and Pilates

exercises on trunk muscle endurance in cricketers. The total number of subjects were 30, 15 subjects were allotted into Pilates exercise group and 15 subjects were allotted into floor exercises group. The protocol was given for 8 weeks. According to the data analysis a significant difference was found between the pre and posttest values of trunk flexor endurance, trunk extensor endurance, and trunk lateral endurance test in Pilates exercise group. There was a significant difference between pre and post values of trunk flexor endurance, trunk extensor endurance and trunk lateral endurance test in the floor exercise group. The result of the present study showed that subjects in the Pilates exercise group showed a significant improvement in trunk muscle endurance there was an improvement of trunk flexor endurance, trunk extensor endurance and trunk lateral endurance when compared to the floor exercise group in cricketers<sup>1</sup>.

Stability is achieved through the co-activation of trunk muscles; therefore, endurance training has been postulated to be beneficial in training trunk muscles to provide stability<sup>5</sup>. Muscle endurance is a muscle's ability to contract repeatedly against a load for a longer duration without fatigue. In fact, most of our daily activities require some muscle endurance. The most important trunk stabilizers are the trunk flexors and extensors. Muscle endurance, rather than muscle strength, may be a more important factor in trunk stability<sup>16,17</sup>.

McGILL et al, advocated the use of McGILL's trunk endurance test to evaluate the trunk musculature stamina<sup>18</sup>. These tests often measure one aspect of core stability, such as muscle recruitment, muscle strength and endurance, postural control, balance or

movement patterns<sup>15</sup>. The tests assess trunk stability during functional positions and movements, however, good reliability based on observation and grading scales is lacking<sup>19,20</sup>.

A study by Cosio Lima et al, showed the effects of physio ball and conventional floor exercises on early phase adaptation in back and abdominals core stability and balance in women. The physio ball group was found to have significantly greater mean change in EMG flexion and extension activity ( $P=0.04$  and  $P=0.01$ , respectively) and greater balance scores ( $P < 0.001$ ) than the floor exercise group<sup>21</sup>.

The Pilates method using functional exercise improve the muscular strength and endurance. June A. Kloubec suggests that individuals can improve their muscular endurance and flexibility using relatively low-intensity Pilates exercises that do not require equipment or a high degree of skill and are easy to master and use within a personal fitness routine. At the end of the 12-week period, a 1-way analysis of covariance showed a significant level of improvement ( $P < 0.05$ ) in all variables except posture and balance<sup>9</sup>.

As cricketers play for prolonged duration the body requires more muscle endurance and power it is taken into main consideration in this study. When relating to cricket, trunk muscle endurance is very essential as trunk strength is associated with the production and transference of strength between the upper and lower limbs. It has been suggested that cricketers with poor trunk muscular endurance may easily injure passive, pain-sensitive structures of the lumbar spine, which ultimately affects physical performance<sup>22</sup>.

**Ethical Clearance:** Ethical clearance has obtained from Faculty of Physiotherapy, Dr.

MGR. Educational and Research Institute, Chennai, Tamil Nadu, Reference number: No: D-38/PHYSIO/IRB/2020-2021, Dated: 09/03/2021.

**Conflict of interest:** There was no conflict of interest to conduct this study.

**Fund for the study:** It was a self-financed study.

## CONCLUSION

The present study concluded that there was showing improvement in both the groups Pilates and Floor exercise on improving the trunk muscle endurance among cricketers.

On comparing both the groups, Group A (Pilates exercise) showed better improvement than the Group B (Floor exercise) in improvising the muscle endurance among cricketers. Group A Pilates exercise showed a beneficial improvement in posttest values when compared with Group B floor exercise posttest values. Hence the null hypothesis was rejected and accepted alternative hypothesis of this study.

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